

Claims

We claim:

1. A method for correcting an adaptively sampled distance field of a model, the adaptively sampled distance field including a plurality of cells, each cell storing a plurality of distance values at vertices of the cell, the cells including interior cells, surface cells, and exterior cells, and neighboring cells having a common edge, comprising:

marking selected cells as unprocessed cells;

marking surface cells as processed cells;

marking a particular vertex of each unprocessed cell as a minimum vertex, the minimum vertex having a minimum absolute value distance value;

sorting the unprocessed cells in an ascending order of the minimum vertices;

and

a) appending, for each common edge of each unprocessed cell, in the sort order, distance values of neighboring processed cells to the common edge;

b) adjusting the distance values of the vertices of the unprocessed cell according to the appended distance values of the edges and the distance values of the vertices;

c) marking the unprocessed cell as processed; and
repeating steps a, b, and c until all cells are processed.

2. The method of claim 1 further comprising:

marking each vertex of the unprocessed cell as fixed only if the vertex is shared with a neighboring surface cell, otherwise marking the vertex as free;

determining the number of appended distance values associated with each free vertex, the associated distance values located between the free vertex and a midpoint on a particular edge connected to the free vertex;

selecting the free vertex with the largest number of associated distance values;

dividing the unprocessed cell into a uniformly sampled grid at a specified resolution; and

performing a Euclidean distance transform on the uniformly sampled grid propagated from the free vertex corner with the largest number of associated distance values to correct only the free vertices of the unprocessed cell.

3. The method of claim 1 further comprising:

marking each vertex of the unprocessed cell as fixed only if the vertex is shared with a processed cell, otherwise marking the vertex as free;

determining the number of appended distance values associated with each free vertex, the associated distance values located between the free vertex and a midpoint on a particular edge connected to the free vertex;

selecting the free vertex with the largest number of associated distance values;

dividing the unprocessed cell into a uniformly sampled grid at a specified resolution; and

performing a Euclidean distance transform on the uniformly sampled grid propagated from the free vertex corner with the largest number of associated distance values to correct only the free vertices of the unprocessed cell.

4. The method of claim 1 further comprising:

marking each vertex of the unprocessed cell as fixed only if the vertex is shared with a neighboring surface cell, otherwise marking the vertex as free;

adjusting the distance value at each free vertex to a nearest one of the appended distance values.

5. The method of claim 1 further comprising:

marking each vertex of the unprocessed cell as fixed only if the vertex is shared with a neighboring surface cell, otherwise marking the vertex as free;

adjusting the distance value at each free vertex to a combination of the appended distance values.

6. The method of claim 5 wherein the combination is an extrapolation.

7. The method of claim 1 further comprising:

marking the interior and exterior cells as unprocessed if the interior cells and exterior cells are within a specified distance from the surface.

8. The method of claim 1 further comprising:

marking the interior and exterior cells as unprocessed if the interior cells and exterior cells are immediate neighbors of the surface cells.

9. The method of claim 1 further comprising:

marking the interior and exterior cells as unprocessed if the interior cells and exterior cells are located in a specified region of the adaptively sampled distance field.

10. The method of claim 1 further comprising:
marking the interior cells as unprocessed.
12. The method of claim 1 further comprising:
marking the exterior cells as unprocessed.
13. The method of claim 1 wherein particular surface cells are marked as unprocessed.